In the Claims:

Please cancel claims 2-9, 12-19 and 25-46.

Remaining claims are claims 1, 10, 11 and 20-24.

1. In a magnetic read head having an air bearing surface (ABS), a magnetic tunnel junction (MTJ) sensor for connection to sense circuitry for detecting changes in electrical resistance within the sensor, the sensor comprising:

a MTJ stack with an active region disposed at the ABS and having two opposite sides each disposed generally orthogonally to the ABS, the MTJ stack comprising:

an antiferromagnetic (AFM) layer spanning the active region,

a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

a free layer of FM material spanning the active region and extending beyond each of the two opposite sides thereof, and

a tunnel junction layer of electrically nonconductive material disposed between the pinned layer and the free layer in the active region; and

a longitudinal bias layer formed on and in contact with the free layer outside of the active region for biasing the magnetic moment of the free layer in substantially a predetermined direction in the absence of an external magnetic field.

10. The sensor of claim 1 wherein the longitudinal bias layer comprises an electrically nonconductive HM material disposed outside of the active region and in abutting contact with the two opposite sides of the active region.

11. A direct access storage device (DASD) comprising:

a magnetic recording disk having at least one surface for storing magnetically recorded data;

a magnetic read head having an air bearing surface (ABS) disposed for reading the data from the magnetic recording disk surface;

in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:

a MTJ stack with an active region disposed at the ABS and having two opposite sides each disposed generally orthogonally to the ABS, the MTJ stack comprising:

an antiferromagnetic (AFM) layer spanning the active region,

a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

a free layer of FM material spanning the active region and extending beyond each of the two opposite sides thereof, and

a tunnel junction layer of electrically nonconductive material disposed between the pinned layer and the free layer in the active region; and

a longitudinal bias layer formed on and in contact with the free layer outside of the active region for biasing the magnetic moment of the free layer in substantially a predetermined direction in the absence of an external magnetic field;

an actuator for moving the magnetic read head across the magnetic recording disk surface to access the data stored thereon; and

a data channel having sense circuitry coupled electrically to the MTJ sensor for detecting changes in resistance of the MTJ sensor caused by rotation of the magnetic moment of the free ferromagnetic layer relative to the fixed magnetic moment of the pinned layer responsive to magnetic fields representing the data stored on the magnet recording disk surface.

20. The DASD of claim 11 wherein the longitudinal bias layer comprises an electrically nonconductive AFM material disposed outside of the active region and in abutting contact with the two opposite sides of the active region.

21. In a magnetic read head having an air bearing surface (ABS), a magnetic tunnel junction (MTJ) sensor for connection to sense circuitry for

detecting changes in electrical resistance within the sensor, the sensor comprising:

a MTJ stack with an active region disposed at the ABS and having two opposite sides each disposed generally orthogonally to the ABS, the MTJ stack comprising:

an antiferromagnetic (AFM) layer spanning the active region,

a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

a free layer of FM material spanning the active region, and

a tunnel junction layer of electrically nonconductive material disposed between the pinned layer and the free layer in the active region; and

a nonconductive longitudinal bias layer formed outside of the active region and in abutting contact with the two opposite sides of the active region for biasing the magnetic moment of the free layer in substantially a predetermined direction in the absence of an external magnetic field.

22. The sensor of claim 21 wherein the nonconductive longitudinal bias layer comprises a hard magnetic (HM) material.

23. A direct access storage device (DASD) comprising:

a magnetic recording disk having at least one surface for storing magnetically recorded data;

a magnetic read head having an air bearing surface (ABS) disposed for reading the data from the magnetic recording disk surface;

in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:

a MTJ stack with an active region disposed at the ABS and having two opposite sides each disposed generally orthogonally to the ABS, the MTJ stack comprising:

an antiferromagnetic (AFM) layer spanning the active region,

a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

a free layer of FM material spanning the active region, and

a tunnel junction layer of electrically nonconductive material disposed between the pinned layer and the free layer in the active region; and

a nonconductive longitudinal bias layer formed outside of the active region and in abutting contact with the two opposite sides of the active region for biasing the magnetic moment of the free layer in substantially a predetermined direction in the absence of an external magnetic field;

an actuator for moving the magnetic read head across the magnetic recording disk surface to access the data stored thereon; and

a data channel having sense circuitry coupled electrically to the MTJ sensor for detecting changes in resistance of the MTJ sensor caused by rotation of the magnetic moment of the free ferromagnetic layer relative to the fixed magnetic moment of the pinned layer responsive to magnetic fields representing the data stored on the magnetic recording disk surface.

24. The sensor of claim 23 wherein the nonconductive longitudinal bias layer comprises a hard magnetic (HM) material.